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MONTHLY NOTICES

OF THE

ROYAL ASTRONOMICAL SOCIETY.

VOL. XXII. *February* 14, 1862. No. 4.

THE Annual General Meeting of the Society, Dr. LEE, President, in the Chair.

Arthur Cottam, Esq., 1 Whitehall Place;
Wm. Thynne Lynn, Esq., Superintendent of Computers, Royal Observatory, Greenwich;
The Hon. Samuel Cockburne, Governor of Montserrat, West Indies;
George Dollond, Jun., Esq., 59 St. Paul's Churchyard; and
Charles Mason, Esq., 16 Queen's Road, Regent's Park,

were balloted for and duly elected Fellows of the Society.

After the business was concluded, a Special General Meeting was held for the purpose of electing Miss Sheepshanks an Honorary Member of the Society, which was done accordingly.

Report of the Council to the Forty-second Annual General Meeting of the Society.

The Report of the Auditors, subjoined, will show the state of the finances:—

RECEIPTS.

	£	*s.*	*d.*
Balance of last year's account	276	19	3
By dividend on £2000 Consols	28	15	0
By ditto on £3500 new 3 per Cents	50	6	3
By ditto on £2100 Consols	30	6	5
Carried forward	£386	6	11

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	£	s.	d.
Brought forward	386	6	11
By dividend on £3800 New 3 per Cents	54	17	3
On account of arrears of contributions	81	12	0
115 contributions (1861–62)	241	10	0
1 contribution (balance for 1862)	1	1	0
7 compositions	147	0	0
35 admission-fees	73	10	0
30 first year's contributions	57	15	0
3 contributions for 1863	6	6	0
Sale of Publications	70	2	0
By cash for India Hill Observatory	1000	0	0
	£2120	0	2

EXPENDITURE.

	£	s.	d.	£	s.	d.
Salaries:—						
Mr. Cayley, 1 year as Editor of the Society's Publications	60	0	0			
Mr. Williams, 1 year as Assistant-Secretary	100	0	0			
Ditto commission on collecting £531 16*s.*	26	0	0			
				186	0	0
Investments:—						
Investing £100 Consols				91	10	0
Taxes:—						
Property Tax, 1 year	4	7	6			
Assessed and Land, ditto	2	1	8			
				6	9	2
Bills:—						
Strangeways and Co., printers	415	15	0			
J. Basire, engraver	42	0	0			
Joyce, engraver	1	10	0			
C. Frodsham, clock	3	7	6			
Insurance (Sun Fire Office)	12	5	6			
L. Wyon, medals	57	15	0			
				532	13	0
Miscellaneous items:—						
Charges on books, and carriage of parcels	4	15	8			
Postage of *Monthly Notices*, letters, &c.	39	15	4			
Porter's and charwoman's work	24	13	6			
Tea, sugar, biscuits, &c. for evening meetings	13	13	0			
Waiters attending meetings	3	17	0			
Coals, &c.	12	0	0			
Sundry disbursements by the Treasurer	28	3	1			
Sundry payments out of Turnor Fund	0	13	6			
Deductions on country cheques	0	1	2			
Mrs. Jackson's annuity, half-year	4	6	8			
				131	18	11
India Hill Observatory, *contra*				1000	0	0
Balance at Banker's				171	9	1
				£2120	0	2

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Assets and present property of the Society, Feb. 8, 1862:—

				£	s.	d.
Balance at Banker's				171	9	1
1 contribution of 4 years' standing	8	8	0			
8 ——— of 3 ditto	50	8	0			
13 ——— of 2 ditto	54	12	0			
33 ——— of 1 ditto	69	6	0			
				182	14	0
Due for publications of the Society				2	2	0
£3800 new 3 per Cents. (including Mrs. Jackson's gift).						
£2100 Consols (including the Lee Fund).						
Unsold publications of the Society.						
Various astronomical instruments, books, prints, &c.						
Balance of Turnor Fund (included in Treasurer's account) ...				59	19	10

Stock of volumes of the *Memoirs*:—

Vol.	Total.	Vol.	Total.	Vol.	Total.
I. Part 1	26	IX.	188	XXI. Part 1 (separate).	204
I. Part 2	68	X.	200	XXI. Part 2 (separate).	100
II. Part 1	85	XI.	210	XXI. (together).	117
II. Part 2	50	XII.	217		
III. Part 1	106	XIII.	234	XXII.	211
III. Part 2	125	XIV.	218	XXIII.	212
IV. Part 1	121	XV.	202	XXIV.	222
IV. Part 2	134	XVI.	223	XXV.	227
V.	154	XVII.	201	XXVI.	239
VI.	174	XVIII.	206	XXVII.	494
VII.	197	XIX.	214	XXVIII.	456
VIII.	183	XX.	211	XXIX.	281

Progress and present state of the Society:—

	Compounders.	Annual Contributors.	Non-residents.	Patroness, and Honorary.	Total Fellows.	Associates.	Grand Total.
February 1861 ...	161	207	31	4	403	51	454
Since elected	5	30	...	...	...	...	...
Deceased	−4	−3	...	...	...	−2	...
Removal	2	−2	...	...	...	...	...
February 1862 ...	164	232	31	4	431	49	480

The instruments belonging to the Society are as follows:—

The *Harrison* clock,
The *Owen* portable circle,
The *Beaufoy* circle,
The *Beaufoy* transit,
The *Herschelian* 7-foot telescope,
The *Greig* universal instrument,
The *Smeaton* equatoreal,
The *Cavendish* apparatus,
The 7-foot Gregorian telescope (late Mr. Shearman's),
The Variation transit (late Mr. Shearman's),
The Universal quadrant by Abraham Sharp,
The *Fuller* theodolite,
The Standard scale,
The *Beaufoy* clock,
The *Wollaston* telescope,
The *Lee* circle.

The *Sheepshanks'* collection of instruments, viz.,—

1. 30-inch transit, by Simms, with level and two iron stands.

2. 6-inch transit theodolite, with circles divided on silver; reading microscopes, both for altitude and azimuth; cross and siding levels; magnetic needle; plumbline; portable clamping foot and tripod stand.

3. $4\frac{6}{10}$ achromatic telescope, about 5 feet 6 inches focal length; finder, rack motion; double-image micrometer; object-glass micrometer; two other micrometers; one terrestrial and ten astronomical eyepieces, applied by means of two adapters.

4. $3\frac{1}{4}$-inch achromatic telescope, with equatoreal stand; double-image micrometer; one terrestrial and three astronomical eyepieces.

5. $2\frac{3}{4}$-inch achromatic telescope, with stand; one terrestrial and three astronomical eyepieces.

6. $2\frac{3}{4}$ achromatic telescope, about 30 inches focus; one terrestrial and four astronomical eyepieces.

7. 2-foot navy telescope.

8. 45-inch transit instrument, with iron stand, and also Y's for fixing to stone piers; two axis levels.

9. Repeating theodolite, by Ertel, with folding tripod stand.

10. 8-inch pillar-sextant, divided on platinum, with counterpoise stand and horizon roof.

11. Portable zenith instrument, with detached micrometer and eyepiece.

12. 18-inch Borda's repeating circle, by Troughton.

13. 8-inch vertical repeating circle, with diagonal telescope, by Troughton and Simms.

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14. A set of surveying instruments, consisting of a 12-inch theodolite for horizontal angles only, with extra pair of parallel plates; tripod staff; in which the telescope tube is packed; repeating table; level collimator, with micrometer eyepiece; and Troughton's levelling staff.

15. Level collimator, plain diaphragm.

16. 10-inch reflecting circle, by Troughton, with counterpoise stand; artificial horizon, with metallic roof; two tripod stands, one with table for artificial horizon.

17. Hassler's reflecting circle, by Troughton, with counterpoise stand.

18. 6-inch reflecting circle, by Troughton, with two counterpoise stands, one with artificial horizon.

19. 5-inch reflecting circle, by Lenoir.

20. Reflecting circle, by Jecker, of Paris.

21. Box sextant and 3-inch plane artificial horizon.

22. Prismatic compass.

23. Mountain barometer.

24. Prismatic compass.

25. 5-inch compass.

26. Dipping needle.

27. Intensity needle.

28. Ditto ditto.

29. Box of magnetic apparatus.

30. Hassler's reflecting circle, with artificial horizon roof.

31. Box sextant and $2\frac{1}{4}$-inch glass plane artificial horizon.

32. Plane speculum artificial horizon and stand.

33. $2\frac{1}{2}$-inch circular level horizon, by Dollond.

34. Artificial horizon roof and trough.

35. Set of drawing instruments, consisting of 6-inch circular protractor; common ditto; 2-foot plotting scale; two beam compasses and small T square.

36. A pentagraph.

37. A noddy.

38. A small Galilean telescope, with the object lens of rock-crystal.

39. Six levels, various.

40. 18-inch celestial globe.

41. Varley stand for telescope.

42. Thermometer.

43. Telescope.

These are now in the apartments of the Society, with the exception of the following, which are lent, during the pleasure of the Council, to the several parties under mentioned, viz.:—

The *Wollaston* telescope, to Mr. Rees.
The *Lee* circle, to Mr. Burr.
The *Beaufoy* clock, to Dr. Booth.

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The *Sheepshanks* instrument, No. 1, to Mr. Lassell.
Ditto ditto No. 2, to Mr. De La Rue.
Ditto ditto No. 3, to Rev. C. Pritchard.
Ditto ditto No. 4, to Rev. F. Howlett.
Ditto ditto No. 5, to Mr. Birt.
Ditto ditto No. 6, to Rev. J. Cape.
Ditto ditto No. 8, to Prof. Wheatstone.
Ditto ditto No. 10, to Rev. C. Pritchard.
Ditto ditto No. 19, to Mr. Dayman.
Ditto ditto No. 23, to Mr. Spottiswoode.
Ditto ditto No. 25, to Mr. Dayman.
Ditto ditto No. 41, to Rev. C. Pritchard.
The double-image micrometer, to Mr. Hodgson.
The 6-inch circular protractor, to Mr. Birt.

Nothing definite has yet been ascertained respecting the other *Beaufoy* clock, the two invariable pendulums, and the quadrant (said to have been *Lacaille's*), reported for many years past as being in the possession of the Royal Society.

The Fellows are aware that the Council intend this day to propose, at a Special General Meeting, that the name of Miss Anne Sheepshanks be added to the list of Honorary Members. The splendid present of instruments made by this lady to the Society, and the large endowment by which she has perpetuated the name of her brother and his astronomical pursuits in his own university, most properly call for such acknowledgment as a Society devoted to Astronomy can give. So much might be said in any similar case. But when it is remembered that the brother whose memory is thus affectionately preserved was one of the best friends this Society ever had, equalled only by Francis Baily in the amount of time and labour which he bestowed upon it, and the untiring zeal with which he served it, the Council feel, and are sure the Society at large will also feel, that the duty of acknowledgment will be performed with greater pleasure in that it again connects us with the name of Sheepshanks.

The Council have to announce the receipt of a handsome reversionary gift. Mrs. Hannah Jackson has made over 300*l.* stock, reserving the dividends during her life, for the promotion of Astronomy by rewards to be given in the name of "Hannah Jackson, *née* Gwilt." The conditions, including some slight modifications to which Mrs. Jackson at once consented on the suggestion of the Council, are as follows. When the endowment takes effect, the accumulations of income, for any term not exceeding seven years, are, at the discretion of the Council, to be from time to time given in the form of a medal, or of money, or both, to the writer of any astronomical work or memoir, the inventor or improver of any astronomical instrument, the discoverer of any new heavenly body, or the promoter in any other way of the science of Astronomy. The Council invite the Fellows to return thanks to Mrs. Jackson, not only for this very munificent gift, but for the judgment shown in allowing the mode of employment to be unfettered by any restrictions which might possibly diminish its utility.

The Council have awarded the Gold Medal to Mr. Warren De La Rue, for his astronomical researches, and especially for his application of Photography. The President will, in the usual way, explain the grounds of this award in detail: but the Council cannot help remarking that this public recognition of the success of chemical delineation of celestial objects may be an important date in the history of Astronomy. No discovery of our day affords a more hopeful field of anticipation than that of photography, which seems destined to take that part in the astronomy of visual phenomena which graduated instruments have taken in the astronomy of motions and positions.

The volume of *Memoirs* will shortly appear. It contains two papers only, these are, first, a Memoir On the Lunar Theory, by Sir J. W. Lubbock, Bart., of which an abstract was published in the *Monthly Notices*, January 1861. The memoir relates chiefly to the comparison and discussion of the numerical values of the coefficients of the several inequalities as given by M. Plana and M. de Pontécoulant, and in the American Tables, Washington, 1853; but it contains also theoretical investigations in relation to the acceleration and to certain long inequalities. Secondly, Observations on Donati's Comet—Sketches and Notes by Messrs. Lassell, Dawes, and Webb, Prof. Challis, the Astronomer Royal, and Mr. De La Rue. The paper is drawn up by Mr. Carrington. It is illustrated by eight plates.

Pursuant to the Report of a Committee on Income and Expenditure, it has been arranged that the ballot for printing of the papers intended for the *Memoirs* is to be deferred until the Council Meeting in June in each year, when a scheme of the whole volume for the year is to be submitted to the Council. The final decision upon papers provisionally approved of for the *Memoirs* is by this regulation deferred until the June Meeting.

The Council have thought it in the interest of the Society to prepare an Index of the *Memoirs*, and to offer sets for sale at a considerably reduced price. The scarcity of parts of the two first volumes has necessitated a considerable difference in the price of complete sets, and sets wanting vols. 1 and 2. The sales have not been very numerous at present, but (in whatever number effected), they tend to diminish the dead stock, to disseminate the writings and conclusions of astronomers, and thereby directly to promote the objects of the Society, assist its funds, and increase the number of those interested in the subject.

It will hardly be necessary to inform the Meeting that the Council thought it their duty to present an Address of heartfelt condolence to Her Majesty, the Patroness of the Society, on the lamented death of the Prince Consort. Our history has never offered an occasion of the kind in which such addresses have been so thoroughly real and genuine. The country has felt for the Queen as if she had been a member of every family in the kingdom; and every useful institution mourns the loss of a real friend in the good and able Prince Albert.

The Society has to regret the loss by death of George Bishop, Esq.; Sir W. Cubitt; T. F. Ellis, Esq.; Dr. Fitton; T. Forster, Esq.; Sir W. K. Murray; General Sir Charles Pasley; W. Wilson, Esq.; M. Daussy; and M. Biot.

GEORGE BISHOP was born at Leicester, August 21, 1785. From the age of eighteen he lived in London, employed in the well-known business to which he eventually succeeded. By this he added to his patrimony and became very wealthy, as do many others who well deserve the praise of serving their country in the way which they choose of serving themselves. But Mr. Bishop had also a strong love of science, and an earnest but very quiet desire of making his tastes useful, and investing some of his money in a way which would produce a higher return than can be measured by per-centage. Astronomy was a particular object of interest to him, and to obtain knowledge of it he cultivated mathematics to a greater extent than would have been supposed likely. When nearly fifty years of age, at the time when the firm establishment of his business made him feel a right to relaxation, he made a very serious study of mathematics, and mastered enough of the *Mécanique Céleste* to obtain a perfect idea of the nature of the great problems of astronomy. His conversation never gave any idea of his knowledge in this and other matters: he listened more than he talked, and was not communicative about himself or his plans.

He had always had a great wish to possess an Observatory, but never had the opportunity until he removed his residence to South Villa, in the Regent's Park. The Observatory was erected in 1836. Mr. Bishop was from the beginning well aware that by far the most important part of an astronomical instrument is the astronomer. This is the foundation of the true theory of an instrument; and the Chaldean shepherd, with no lens except that of the eye, added more to

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the knowledge of the heavens than all the unused telescopes put together. Mr. Bishop, knowing that his own leisure would never suffice to work an observatory, determined that what he could not do others should. From the beginning this was his firm resolution. It was often expressed to the writer of this memoir, who especially remembers one occasion, when both were standing on the spot now occupied by the Observatory, after walking over the grounds to look for a site. "I am determined," said Mr. Bishop, "that this Observatory shall *do something*." The known solar system at that time consisted of eleven planets. Little did either party to the conversation think that the duplication of this number was part of the reward in store for Mr. Bishop's energetic and single-minded resolution to be of use.

Every particular relating to the Observatory will be found in Mr. Bishop's publication, *Astronomical Observations during the years* 1839–51. It is not necessary for us here to describe Mr. Hind's ten planets, that of Mr. Marth, the star in *Ophiuchus*, the variable stars, the new nebulæ, the valuable double-star observations commenced by Mr. Dawes, &c. The ecliptic charts must be mentioned: seventeen are engraved, and it is hoped that the difficulties in the way of the completion are now overcome.

The South Villa Observatory is connected with a succession of excellent astronomers. We need only mention the names of Mr. Dawes and Mr. Hind. Since his appointment to the *Nautical Almanac*, Mr. Hind has taken a general superintendence, the actual observers being in succession Mr. Norman Pogson, Dr. Vogel, Mr. Marth, and Mr. Talmage. Mr. Pogson commenced in this Observatory the career which has produced much and promises more: and this was always a source of high gratification to Mr. Bishop.

Mr. Bishop was elected Fellow of this Society in 1830. He was successively Secretary, Treasurer, and President. It will always be matter of regret that he was never once able to take the chair in the last capacity: the final prostration of strength which accompanied—we may almost say, constituted—his last illness, was nearly simultaneous with his election as President in February 1857. He continued in a state of fluctuating debility, without any loss of mind, until June 14, 1861, when he died without pain.

We cannot here undertake to dwell at length upon the characteristics of this good friend of our Society, and most active, though quiet, promoter of its cause. Those who were on terms of intimacy with him will never forget the excellencies of his private character. Our concern is with the manner in which he encouraged and promoted Astronomy. In 1848, speaking on the award of our Astronomical testimonials, Sir J. Herschel observed that "it does not fall to the lot of every private observatory to have added two planets to our

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list." This was said at a time when the career of discovery of small planets was in its infancy. We may note that on the first opening of this path the energies of the South Villa Observatory were turned at once upon it; and the success which followed was a very great stimulus to the exertions of others. We have much satisfaction in adding that this institution is not to become extinct. It is the intention of Mr. George Bishop the younger to remove the instruments and the dome to his residence at Twickenham, and to continue the course of observation so brilliantly commenced in the Regent's Park.

Sir WILLIAM CUBITT was born at Dilham, in Norfolk, in 1785. As an engineer, his career will be recorded in other publications. He became a member of our Society, as other engineers have done, attracted towards astronomy by its connexion with mechanical adaptation. He was a good transit observer, and he constructed Mr. Cooper's telescope tube. The inventor of the self-acting windmill-sail, the constructor of the great landing-stage at Liverpool, the executive engineer of the railway from London to Dover, the superintendent of the construction of the Crystal Palace of 1851, is not likely to be forgotten in his line. The host of minor undertakings which he directed is past all enumeration; and it must not be forgotten that he deserves the thanks of every honest man as the inventor of the treadmill.

Sir William Cubitt was the son of a miller, and became a millwright after being apprenticed to a joiner. He has, accordingly, been represented as having risen in the face of every disadvantage; but this was not the fact, though easily credible of such a man. The apprenticeship was probably considered as an additional introduction to his intended career, he having already had much experience of the special working of a mill in his father's business.

Mr. Bidder states that his success was in a great degree to be ascribed to the soundness of his early mechanical experience, which he never failed to impress upon all the younger members of his profession. He died in October last.

THOMAS FLOWER ELLIS was born December 5, 1796, and died April 5, 1861. He was educated at Cambridge, where his career in classics was distinguished, and he gained a fellowship at Trinity College in 1819, which he vacated by marriage in 1820. He was called to the bar in 1824, and continued in practice till his death, being for many years one of the reporters of the Court of Queen's Bench. In 1839 he was made Recorder of Leeds, and Attorney-General for the Duchy of Lancaster. He was one of our earliest members, having been elected in May, 1820. He was elected to the Royal Society in 1847, and was also a member of the Cam-

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bridge Philosophical Society, the Philological Society, &c. On the Northern Circuit he made the acquaintance of the late Lord Macaulay, with whom he contracted a warm friendship. Lord Macaulay made him his executor, and in this capacity he edited the posthumous works of his distinguished friend.

Mr. Ellis was one of a class which is more numerous in England than in any other country—the class of persons who carry into professional life what would on the Continent be a *professorial* knowledge of literature or science, and make it the duty of their leisure to apply it to the benefit of others. He was for many years a hardworking member of the Society for the Diffusion of Useful Knowledge, which he took up from the commencement with the feeling of personal responsibility for what was published by that corporation. In various other ways he was steadily applying himself to utilities of the same kind. In his career at the bar he also occupied a post of importance, to which no public recognition is attached. The reporters of our courts of law, on whom the judges mainly depend, not only for precedents, but for the arguments on which they are founded, are themselves unknown to the courts whose proceedings they record, and belong rather to the publishers who undertake the volumes of reports than to the great system which lives and grows by their publications. But we believe we may say that the judges themselves are not more free from all impeachment than their reporters.

Mr. Ellis was attached both to literature and to science, but his tastes were of a very mathematical cast. His principle, throughout life, was the promotion of knowledge; and in this field he worked from the time when he joined our Society in its infancy to the end of his useful life. None but those who were either his friends or colleagues were cognisant of his career.

The Council regret that his pursuits of necessity severed him from active participation in our meetings of the Society; and they feel that they have lost a member whose course of life was a continual credit to every Society whose designation he attached to his name, and to ours from its very commencement.

The Council regret that they cannot procure an account of Dr. Fitton. This zealous geologist had been a Fellow of the Society since 1825, and, though not immediately connected with astronomy, often attended our meetings. Almost to the last he was seen among us on occasions when important subjects were agitated.

Thomas Ignatius Maria Forster was born in Threadneedle Street, November 9, 1789. He was of an ancient Border family, which was confiscated in the Rebellion of 1715.

His father, who was in business, was a zealous botanist, and published a *Flora Tunbrigiensis* in 1812. His uncle, B. Meggot Forster, was known by many papers on physics and botany; and another uncle, Edward, a partner in the house of Lubbock and Co., was also known as a botanist. Thomas Forster has left an account of his own life, published in French at Brussels in 1836: he speaks in detail of the botanical tendency of his family, and says that as soon as the ledger was shut the *hortus siccus* was open. He himself began, at the age of sixteen, a *Liber Rerum Naturalium*, and a *Journal of the Weather*, which he continued till his death.

At the age of seventeen he became acquainted with Spurzheim, whose system he adopted. It was Mr. Forster who gave the name of *Phrenology* to what was till then called *Craniology*, in a tract entitled *Sketch of the Phrenology of Gall and Spurzheim*, London, 8vo, 1816. Spurzheim told him that he had a head well organised for science, but with too much *ideality* to allow it to be used with effect.

Mr. Forster was a member of Corpus Christi College, Cambridge, and took the degree of M.B. in 1819. In 1817 he married a daughter of Colonel Beaufoy, a well-known Fellow of this Society, which he himself joined in 1824. He led a wandering life till about 1834, when he settled in Belgium, where he remained till his death, either at Brussels or at Bruges. He spoke and wrote various languages with facility. His detached works are beyond all enumeration: most of them are on atmospherical and meteorological phenomena, not forgetting an account of a balloon-ascent which he made in 1831. One of his earliest works, *On the Brumal Retreat of the Swallows*, published under the name of Philocheledon, reached a sixth edition in 1817.

When M. Quetelet showed him some accounts of the shooting stars of August 10, he was greatly astonished; but a few days afterwards he pointed out to M. Quetelet that he had long before announced the phenomenon as periodic, in his own Atmospherical Calendar, which he had entirely forgotten. This was made known at the time.

Mr. Forster was an upright and amiable man, with many peculiarities of mind and habit; a scholar and a linguist of very wide reading, and zealously attached to observation of natural phenomena.

Sir William Keith Murray, Bart., was born at Ochtertyre, in Perthshire, on the 19th of July, 1801. Educated at Harrow and Sandhurst, he entered the army in 1821, joining the 42d Highlanders, where he attained the rank of captain. In 1830 he left that celebrated corps, and joined the Perthshire Militia as lieutenant-colonel. More recently still, on the rise of the Volunteer movement, he was appointed colonel of the

Perthshire Rifle Volunteers, and engaged both enthusiastically and laboriously in those new duties until within a few weeks of his death.

At Sandhurst he had been distinguished for proficiency in military sketching and outline drawing—a talent which he employed abundantly and to good purpose in after-life—publishing, in 1832, a volume of his original sketches of Scottish and Highland scenery, taken in that manner.

He was also an accomplished musician, and was most skilful at the turning-lathe. His taste for telescopic observing only manifested itself later in life; but having, in 1850, erected at Stonehaven a small equatoreal-room of 15 feet in diameter, on the plan described by Sir John Herschel in his work on the *Southern Heavens as observed at the Cape of Good Hope*, he commenced a larger Observatory in 1853, at his family seat of Ochtertyre, and published a description of it, with plates, in 1859.

The most noteworthy particular of the building was, perhaps, the mounting of the great dome, 18 feet in diameter, on the rims of large (2-foot) wheels, the axes of which rested on *fixed* bearings in the wall; proving that this was both an economical and effective practical method of securing an easily revolving roof. Of the instruments, the chief one was an equatoreally-mounted telescope, of 9 inches aperture, by Cooke and Sons, of York. The optical qualities of this object-glass he was most unwearied in testing on every known difficult object in the heavens, month after month, and year after year, until he had put beyond all doubt the quality of Mr. Cooke's optical work.

With all this energy and determination of purpose, Sir William preserved remarkable modesty amongst learned men, and ever showed the most kind attention to the wishes of his neighbours and the educational interests of his tenantry and the inhabitants of the neighbouring towns and villages. Hence his own advance in science was much impeded by the time he devoted to others; and an interesting specialty of his Observatory always was, the large number of very respectable telescopes which he had fitted up for the use of all who chose to profit by them. His popular lectures in the neighbourhood were frequent and well attended, illustrated generally with great skill by his own mechanical or optical contrivances. He was, in short, never weary of well-doing according to his position in life, and was one of those men occasionally met with in the world who are gifted with almost superhuman activity, seldom requiring more than three or four hours' sleep, and busily engaged in working or superintending the work of others through the remainder of the day.

Sir William was twice married—first, in 1833, to the only daughter of Sir Alexander Keith, of Ravelstone and Dunottar, in whose right he assumed the name of Keith; and secondly,

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on the death of this lady, after having had by her eight sons and three daughters, to Lady Adelaide Hastings, youngest daughter of the first Marquis of Hastings. Lady Adelaide died in December, 1859; and Sir William Keith Murray, who never fully recovered from the effect of her loss, was carried off by an attack of typhus fever in October 1861.

General Sir CHARLES WILLIAM PASLEY, K.C.B. and D.C.L., died at his house at Norfolk Crescent, Hyde Park, on the 19th of last April, in his eighty-first year, having been a member of this Society during twenty-seven years. He was also a Fellow of the Royal, the Geological, the Geographical, and the Statistical Societies, being everywhere active in the cause of practical science.

This distinguished officer was born at Eskdale-Muir, Dumfries, on the 8th of September, 1780, and received the rudiments of his education in the High School at Edinburgh. He was appointed a second lieutenant in the Royal Artillery in his seventeenth year, from whence he was transferred to the Royal Engineers, where he became a captain in 1807, a lieutenant-colonel in 1814, and a colonel in 1831. He was promoted to the rank of major-general in 1840, lieutenant-general in 1851, and general in 1860.

The early years of Pasley's career in the army were marked with activity and incident. In 1799 he was stationed in Minorca, where he remained three years, and was then sent to Malta, in which island he rendered himself very serviceable, insomuch that General Villettes selected him to go with a confidential communication to Admiral Lord Nelson: and here his professional talent was evinced in a scheme for protecting the exposed heights of Corradino by means of four strongly fortified trapezium redoubts, the plan of which is still preserved among the muniments of that island. He served at the defence of Gaeta in 1806, under the Prince of Hesse Philipstadt; at the battle of Maida with Sir John Stuart; and at the siege of Copenhagen, under Lord Cathcart, in 1807. In the following year he was sent to the Peninsula, where he was in several sharp skirmishes, as extra aide-de-camp to Sir David Baird; and at the battle of Corunna he acted in the same capacity to the commander-in-chief, Sir John Moore. Captain Pasley next served in Walcheren, where, on the 9th of August, 1809, he received a bayonet-wound through the thigh, and a musket-shot which injured the spine, in leading a storming party to a French advanced work on the dyke in front of the citadel of Flushing.

In these incessant services it was the good fortune of Captain Pasley to win the approbation of all the generals under whom he was placed, and by all of whom he was employed on special duties and trusty missions. But his personal activity for the field having been restricted in consequence of the severe wounds which he had received, Lord Mulgrave appointed him Director of the Royal Engineer Establishment for Field Instruction at Chatham, which important post he ably held from the year 1812 till the end of 1841. Nor in this Society should it be forgotten that he there founded an efficient Observatory for initiating young officers into practical astronomy, and which was also supplied with such portable instruments as a military engineer ought to be acquainted with. Shortly after quitting Chatham, he was nominated an Inspector of Railroads.

Meanwhile Colonel Pasley had directed his energetic mind to the removal of wrecks under water by means of voltaic explosions of gunpowder; and in 1838 he blew to pieces the sunken hulls of two merchantmen in Gravesend Reach, so that their fragments were easily weighed. So fortunate an operation led to the gigantic enterprise of clearing the road of Spithead from that well-known incumbrance, the Royal George, a first-rate man-of-war, which had been lying at the bottom more than half a century. This arduous undertaking was most successfully executed; and by the public sale of the guns, copper, timber, and *débris* which were fished up, this very important anchorage was cleared without any expense to the country.

We must mention, in conclusion, that Sir Charles Pasley was an author of considerable note. In 1810, a time of great alarm, he published a very remarkable volume on the *Military Policy of Great Britain.* It was much read, and is a valuable book, whether considered as to its enlarged political views, its fair and candid reasonings, or its spirited patriotism—a meed which is granted even by those who cannot concur in all its doctrines. He also wrote *A Course of Elementary Fortification*, in 2 vols.; *Practical Geometry and Plan-Drawing; Improvement of English Weights and Measures;* and *Rules for undertaking the Operations of a Siege.*

For more than half his life Sir C. Pasley strongly advocated the introduction of decimal coins, weights, and measures—never holding with those who would introduce the French units into this country, but desiring the complete introduction of the decimal principle of division. Of this proposal he was one of the earliest supporters.

William Wilson was born in Spitalfields in the year 1768. His career affords a striking example of the effect of self-culture in overcoming the disadvantages of a very limited education and want of position. When a mere child, he was employed by a weaver as what was then called a draw-boy. He was afterwards apprenticed to a chair-maker, and followed that calling for a time; but having a strong natural bias towards scientific pursuits, he devoted his leisure to the acquirement of that kind of knowledge, and by industry and

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perseverance succeeded in raising himself far above his original position.

In 1796 he joined the Mathematical Society of Spitalfields, a Society which was established in 1717 for the purpose of mutual instruction in the mathematics and the promotion of general science. Here he soon distinguished himself, for the Society having, in 1795, removed to convenient premises in Crispin Street, it was shortly after proposed that a course of elementary lectures on the various branches of natural and experimental philosophy should be annually delivered, to which the public should be admitted at moderate cost. Mr. Wilson, in co-operation with Mr. Joseph Stevens, the Engineer to the East London Waterworks, rendered most effective assistance in carrying out this scheme. The first of these courses was delivered in 1798, and they were continued for nearly thirty years, Mr. Wilson taking an active part in their delivery during the whole of that time.

He was for many years Assistant to Mr. William Allen, Lecturer on Chemistry at Guy's Hospital. When, in 1825, his services were no longer required by that gentleman, having but slender means of support, the Committee of the Mathematical Society, in consideration of the eminent services rendered by him to the Society for so many years, gave him the entire benefit of the course of lectures for that season. Mr. Wilson, consequently, delivered the whole course, being a series extending over about twenty consecutive weeks; the writer of this notice officiating as his Assistant.

He was afterwards employed as Superintendent of the workmen of the Gasworks at Haggerstone; and when, after many years' services, the infirmities of age compelled him to retire from active business, a competent annuity from that Company afforded him adequate support for the remainder of his life.

Although entirely self-taught, Mr. Wilson's attainments were of no common order. He was not only well versed in the mathematical principles of natural and experimental philosophy, in illustration of which he, in conjunction with his friend Mr. Stevens, constructed a great variety of ingenious apparatus, admirably adapted to explain and demonstrate those principles to an audience, but he was an excellent chemist, as may be seen by a reference to an important series of experiments on the explosive compound of chlorine and nitrogen, then newly discovered, which in the year 1813 he undertook, in conjunction with Messrs. R. Porrett and Rupert Kirk, an account of which is published in the thirty-fourth volume of Nicholson's *Journal of Natural Philosophy, Chemistry, and the Arts.* He was also a botanist and mineralogist, and formed a large collection of objects for the microscope, mounted with his own hands. In short, there was scarcely any portion of the science of his day to which he had not applied himself with success. He was much and deservedly respected by the members of the Mathematical Society, as he was at all times ready to communicate any information in his power to an inquirer, and endeavoured to render such information as intelligible as possible. For many years he was the senior member of that Society, but never filled the office of President. He became a Fellow of this Society when the junction of the Mathematical Society with it took place in 1845. He died in January, 1861, in his ninety-third year.

Pierre Daussy was born at Paris, October 8, 1792; his father was what he afterwards became, *Ingénieur Hydrographe.* While engaged in the school of hydrography, he studied astronomy in theory and practice at the observatory of the *Ecole Militaire,* under Burckhardt. From 1810 to 1814 his time was mostly devoted to astronomy. His occultations were published in Zach's *Correspondance.* He calculated the orbits of the second comets of 1814 and of 1737. In 1813 he presented to the Institute a memoir on the perturbations of *Vesta,* which gained the Lalande medal. A second and more extensive memoir on the same subject was published by the Bureau des Longitudes in the *Connaissance des Temps* for 1818; and tables founded on the elements therein contained were published in the same work for 1820.

From 1816 to 1826 Daussy was employed in triangulations which extended along the coast from Brest to Bayonne, thus joining the whole coast to the great triangulation. Puissant spoke in high terms of the execution of this work, and states that its agreements with the larger triangulation show the two to be parts of one whole. The *précis* of the whole was published in 1829, at the end of the *Exposé des Travaux, &c.,* of M. Beautems-Beaupré. In 1829 he was employed in the connexion of the Channel Islands with the coast near St. Malo, at which time he also paid special attention to the local tides, on which he published two memoirs in the *Connaissance des Temps* for 1834 and 1838. His researches led him to the discovery, since verified by others, of the variation of the mean level of the sea with the height of the barometer.

It is not our place to follow Daussy through the long train of purely geographical labours by which he bore his part, and no small one, in raising the French school of hydrography to a high pitch of reputation and of utility to the whole world. An excellent account of the whole, though short, will be found in the notice by M. de la Roquette, inserted in the 20th volume (4th series) of the *Bulletin de la Société de Géographie.* He died September 5, 1861. His personal character was of the highest, and he was respected accordingly. Of the various marks of consideration which he received, the one which is now best worth noting is, that he was President of the Geographical Society of Paris. He was of the Institute of the Legion of

Honour, Astronome Adjoint of the Bureau des Longitudes, &c.

Just as this Report was ready for the Meeting news arrived of the death of Jean Baptist Biot, the oldest Associate of the Society, and the last of the celebrated *savans* of what he himself called the first edition of the French Republic. M. Biot would have been 88 years old if he had lived two months longer; and to the last he was actively employed. In November, 1861, he completed an elaborate survey of Chinese Astronomy for the *Journal des Savants*. Biot was alive in the time of D'Alembert and Voltaire, with either of whom, as a child, he might have talked; thus, better than by dates, we gain a notion of the long period through which he lived. It is necessary to defer until next year all detail of the labours of this distinguished cultivator both of science and letters.

In the ordinary operations of the Royal Observatory, Greenwich, very few changes have been introduced during the year 1861. The observations are of precisely the same character as before, and the reductions have been made to keep pace with the observations. The volume for 1860 has been very nearly passed through the press. The formation of a catalogue, embracing the star-observations from 1854 to 1860, is vigorously progressing.

The Great Equatoreal has been principally employed in observations of *Jupiter* and *Saturn*. A connected series of drawings of these planets has been made. The instrument has also been employed in observations of Comet II., 1861.

It has been known for several years that interruptions of communications by the Galvanic Telegraph occur, from time to time, produced by spontaneous galvanic currents passing through wires whose extremities are connected with the earth. Arrangements have now been made, and the works are in progress, for the self-registering of these earth-currents at the Royal Observatory. A grant for this purpose has been made by the Admiralty, and the arrangements have been much facilitated by the liberality of the Directors of the South-Eastern Railway, along whose lines the wires are to be carried, and by assistance rendered, in several ways, by their indefatigable Superintendent of Telegraphs, C. V. Walker, Esq.

The observations of the Royal Observatory, Edinburgh, are printed to the end of 1859, and in the Meridian Department are being continued as usual, or, it is hoped, with more than usual accuracy, in consequence of the successful completion during the last year of a long series of experiments which have been carried on during many years with the view

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of removing some acknowledged defects from the sidereal clock—a most vital part of a meridian observatory.

The Astronomer's attention had long been called to the subject on account of the double evils,—1st, of minute changes of rate, dependent on small and rapid variations of temperature; and, 2d, of inaudibility of the seconds' ticks in the high winds of an exposed hill-top. Each of these difficulties has now been overcome with as much completeness as if the other had had no existence, although at first they appeared to require antagonistic applications; and the result is, that the *time-keeping* department of the old transit-clock has been confided, pure and simple, to a clock (that which was presented to the Observatory by the late Sir Thomas Brisbane) enclosed, at a distance from the transit-instrument in a closet, in a covered part of the Observatory, tending to equal temperature (in the manner of the position of the Normal Clock at the central Observatory of Pulkova); but the *observing* department of the same old transit-clock is now taken up by a different clock altogether, and one the whole mechanical arrangements of which are devoted to enabling the seconds to be seen and heard by the observer at both the transit-instrument and mural circle, as easily and powerfully as possible; while its rate of going is taken electrical charge of by the other, or the time-keeping clock in the dark closet. By means of a small tilt-hammer, which strikes at every second on the outside of the case of the observing-clock, the audibility of the seconds tick seems carried to the highest desirable point; and by Mr. Jones' (of Chester) method of electric controlling, the required action of galvanism has been attained with invariable certainty, and at the smallest current expense for electricity that can well be conceived, as is judged after the experience of about nine months.

Almost simultaneously with the improvement of the sidereal-clock system of the Observatory, a considerable extension of its duties took place with regard to its mean-time arrangements; for the public of Edinburgh, no longer content with a visible signal of the true time daily, demanded an audible signal of it as well, in the shape of a cannon fired from the Castle of Edinburgh by electric influence from the Royal Observatory, Edinburgh; and having raised voluntary subscriptions to pay all expenses, except those incurred at the Observatory, they procured the necessary authorisation from Government to carry out the work. The mechanical arrangements have been carried out with much precision.

Amongst the extra duties of the Observatory, the reduction, for the Registrar-General of Births, Deaths, &c. in Scotland, of meteorological observations from fifty-five meteorological stations in the North, still goes on, and occupies much time.

During the last severe winter and spring the health of the Astronomer and Assistants suffered so much, that the Board of Visitors was induced, during the summer, to take up the important subject of suitable accommodation for the observers, but were not able to come to any practical result at present. The official house of the Astronomer is not only at a considerable horizontal distance from the Observatory, but at a lower level by so much as two hundred and forty feet vertical: the labour of such a journey, by both night and day, and through all seasons of the year, is enough to sap the health of any one, especially when it is remembered to engage in what sort of sedentary computing occupation the chief part of the ascents are made.

At the Radcliffe Observatory, Oxford, the arrears of the printing of the Observations have been lessened by the publication of the nineteenth volume of the *Radcliffe Observations*, and the reductions have been carried on with sufficient vigour to ensure the speedy publication of another volume, containing the Observations of 1859 and 1860. The printing of the Observations of 1859 is nearly completed.

Throughout the year 1861 the meridian observations were made as before with the transit instrument and meridian circle, the chief subject of observation being the completion of Mr. Johnson's Catalogue of Remarkable Objects. In the summer, however, of 1861, there was purchased, with the consent of the Radcliffe Trustees, the transit circle belonging to Mr. Carrington, which had been used with such good effect by him at Red Hill. Mr. Main himself superintended the mounting of it at Oxford on the same piers that were used at Red Hill, and the whole was successfully accomplished considerably before the end of the year. Actual observations were commenced with it at the beginning of the present year, the chief subject of observation being the stars visible there between the fifth and the seventh magnitudes. In addition, the Sun is observed, and the Moon till opposition, together with some of the large planets, and such of the minor planets as can be seen with the telescope, of which the diameter is 5 inches.

With the heliometer Mr. Main has been engaged with the observation of a catalogue of double stars, and has already observed considerably more than one hundred. *Jupiter* and *Venus* have been also well measured. A long series of observations of the Great Comet of 1861 was also made, and the results have been communicated to the Society, and are printed in the December Number of the *Monthly Notices.*

The Photographic Meteorology has been well kept up as in former years, but with a diminished staff since August last. The only assistants employed at the Observatory since that time are Mr. Quirling and Mr. Lucas; and it is due to the energy and zeal of those gentlemen to state, that so large an

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amount of work could not be done without the most incessant exertions on their part. The Observatory has, in addition, the advantage of Mr. Luff's services as a computer; and these have been most valuable and useful.

It may be considered that the prospects of the Radcliffe Observatory for the future are encouraging. It is now adequately supplied with excellent modern instruments, which are employed effectively for useful purposes; and, though the staff of assistants is small, it will probably be found, by economy of labour, adequate to the carrying out the views of the Directors, and to the sustaining of the past reputation of the Observatory. We are sure, moreover, the Society will duly appreciate the enlightened liberality of the Trustees, in purchasing without hesitation the Carrington Transit-Circle, as soon as it was explained to them that the demands of science at the present time required the establishment of an instrument of that class.

The Observatory of Cambridge is at this moment in the state which necessarily arises from a change of superintendence, and, to some extent, of system. Professor Challis discontinued residence at Michaelmas, and Professor Adams is on the point of commencing residence, having been in charge since Mr. Challis left. The interval has been employed in making some alterations which would, perhaps, hardly be thought worthy of mention, but both gentlemen speak so strongly of the improvement effected, that notice may be taken of them in illustration of the importance of little aids to convenience. The calculating-room had been intended to receive an instrument, and the slits in the sides and roof gave it that tendency to equality of temperature with the outer air which promotes observation more than calculation. The Superintendant's private room was also a thoroughfare.

By aid from the Sheepshanks' fund, Mr. Challis completed the reduction of all the meridian observations made under his care, and also made some progress in the final reduction of the equatoreal observations. The printing is about to be commenced. A long and good series of the conspicuous comet of July last was carried to nearly the end of the year: the publication awaits the determination of some of the comparison stars. The transit of *Mercury* and the Solar Eclipse were hidden by clouds.

Mr. Adams, without having settled details of plan, intends to take up some definite class of observations, of not too extensive a character for his staff, and to discuss the results: without binding himself to engage largely in the routine observations which are sufficiently attended to at Greenwich. This plan he takes to be most fitted to create and keep up in the University a spirit of astronomical inquiry, one of the chief objects for which the Observatory was founded.

The University Syndicate, after paying a well-merited compliment to the long and able services of Mr. Challis, rejoice that the Observatory has still the advantage of his official connexion with it as Plumian Professor. In this the Society will join; and the astronomical world will look forward to good results from the union of the efforts of Mr. Adams and Mr. Challis, with the power of obtaining subordinate labour which the Sheepshanks' fund is likely to add.

When the Astronomer is far removed from the society of his scientific colleagues, events of his domestic life may become legitimate objects of mention in our Report, in all cases of which the Fellows would desire to convey the expression of sympathy. The zealous Astronomer of the Cape of Good Hope will feel assured of the sincerity with which the Society expresses its regret at the death of Lady Maclear.

Encke's Comet was found at the Cape early in December. To use Sir T. Maclear's words, "it comes up sharp to the predicted orbit." It was, however, too faint for good observation when the last letters were received.

The extensive alterations and improvements at the Liverpool Observatory are now completed, and Mr. Hartnup is again at work with the Equatoreal. The new arrangements for testing and rating chronometers are much admired by all who have seen them, and fully answer Mr. Hartnup's expectations. The results of the first trial of chronometers with the new arrangements have been published in the *Horological Journal*. The new room having been found too large for the normal clock to be heard distinctly in every part, another clock has been added and successfully controlled by Mr. Jones' method, so as to produce perfect coincidence of beat with the normal clock. This new clock has a dial, twelve inches diameter, and a seconds' hand only, the minute and hour hands not being required; it is controlled with the same current which is used for working the relays in connexion with clocks in different parts of the town, and the battery power is, consequently, excessively great in comparison to the driving power. On first starting this clock, the beat, with the current on, soon fell behind that of the normal clock from one to two-tenths of a second, and remained so till the pendulum of the controlled clock was shortened, so as to make it gain a little; the coincidence was then found to be perfect, and it has required no alteration since. Mr. Hartnup states that when the escapements and pendulums of these clocks are made under the direction of the inventor and patentee, there is no danger of stopping them by reversing the current or applying it at the wrong time, as he has repeatedly tried the experiment with the small clock above named, and also with the large clocks in the town, one of which has six dials of eight feet diameter

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each. The Town Hall clock, which has four dials, formerly went very irregularly, and sometimes stopped during high winds, frost, or snow; but since it has been controlled from the Observatory, the severity of the weather has neither stopped it nor interfered with the regularity of its performance.

All the public clocks belonging to the Dock Estate are now placed under the management of Mr. Hartnup, and a man is attached to the Observatory to look after them. Of all the methods which have been adopted in Liverpool for the dissemination of accurate time, the seconds' clock, which is controlled from the Observatory, appears to be the most highly appreciated by the public. This clock is placed in the office-window of the Magnetic Telegraph Company, and can be seen from the Exchange flags. On the 4th February, 1861, the Secretary of the Telegraph Company caused the number of persons to be counted, and between 6 A.M. and 5 P.M., 1860 persons compared watches or chronometers with this clock. The seconds' clock above named makes contact every minute at the sixtieth second, and a current is returned to the Observatory to show that it is correct. In addition to this, an arrangement has recently been made by the Engineer of the Magnetic Telegraph Company, at the suggestion of Mr. Hartnup, by which the return current can be passed on to London.

Attached to one of the Liverpool instruments there is a switch, which, when turned, prevents the clerk from working, and leaves the wire exclusively to the clock; so that at any time, day or night, when the wire is not wanted for ordinary work, London can receive time-signals from Liverpool every minute, and the errors arising from dependence on a single current are in this way avoided.

The meteorological work of the Observatory has, Mr. Hartnup says, been much heavier during the past year than heretofore. The Underwriters are beginning to take more interest in this department, the efficiency of which will shortly be greatly improved by the addition of a self-registering barometer of a novel construction.

Professor Grant reports that, at the Glasgow Observatory, attention is chiefly devoted to the reobservation, with the Meridian Circle, of a selection of stars in the British Association Catalogue ranging between the sixth and eighth magnitudes. It is also contemplated to include in the list of objects for observation some of the smaller stars of the Armagh Catalogue which have been found to exhibit a considerable proper motion. Negotiations are at present in progress for supplying the Observatory with an equatoreally-mounted refractor of considerable dimensions. The Town Council have finally decided upon laying down a wire between the Observatory and several of the city clocks, with the view of having the latter controlled by the application of Jones's electro-magnetic method. In all probability a similar connexion will shortly afterwards be established between the Observatory and the time-ball which is daily dropped for the use of the shipping in the Clyde.

With respect to the proceedings of the Hartwell Observatory during the last year, since the departure for Madras of Mr. Pogson, who was observer from December 1860, little of interest to the public has been done.

Mr. Pogson is busily engaged in preparing the Hartwell and Madras Atlas of Variable Stars, at moments when not occupied by his public duties as Astronomer at Madras; and his situation in the Observatory at Hartwell has not been filled. Meanwhile the several instruments are at the disposal of Admiral Smyth and Captain Jacob.

Among other observations, Encke's Comet was picked up by Mr. S. Horton, the Assistant, on the 24th, 26th, and 30th of last November.

Mr. Lassell writes from Malta that he has succeeded in the perfectly successful erection of the 4-foot equatoreal, on a favourable site near Fort Tigné, on the north side of the Quarantine Harbour. The whole was effected without any accident, either in transmission or erection; and the mirror now in use, when its coat of varnish was dissolved and removed, came out as fine in lustre as if it had been just polished. Mr. Lassell now feels that he has such an instrument as he never had before, and he begins to be dissatisfied with his previous drawings. Some remarks on the performance of his telescope, and the discovery of a new star in the trapezium of the great nebula of *Orion*, will receive due attention at the next ordinary meeting of the Society.

Mr. Balfour Stewart, Director of the Kew Observatory, states that during the past year several experiments were made at Mr. De La Rue's request, to ascertain whether any advantage resulted by increasing the aperture of an object-glass beyond that found adequate to the production of a good sun-picture. The aperture of the heliograph was cut down by stops to 2 inches, and gradually increased to the full aperture of 3¼ inches; but it was not found that increase of aperture showed more details or gave a sharper image than with the 2-inch diaphragm. Preparations were made for photographing the transit of *Mercury* on November 11; but, unfortunately, the day proved hopelessly cloudy, and the Sun was not visible.

From November 7th to 20th, a very complete series of solar photographs were obtained, which have been placed in Mr. De La Rue's hands for measurement with his new instrument. They are thirty-six in number, and of great beauty, showing the minute details on the Sun's disk with remarkable precision. They render evident the capabilities of the instrument, and the command of it possessed by Mr. Beckley.

Only two pictures could be obtained of the partial eclipse of December 31, in consequence of the clouded state of the sky and a thick mist which obscured the atmosphere; each of the pictures required an exposure of several seconds. With the instantaneous apparatus not the slightest trace of an impression was formed.

Since the 31st December the optical part of the heliograph has been removed from the stand and transferred to Mr. De La Rue's Observatory at Cranford, that gentleman having undertaken to register the Sun's disk by means of the Kew instrument.

At the Observatory, Cranford, a series of experiments has been made with the view of obtaining photographic pictures of the Sun's surface on a very large scale, in order to show the details of the spots and other markings with sufficient distinctness to render evident the changes which take place in them. After many trials, which at first gave very little promise of success, Mr. De La Rue succeeded in procuring pictures of the Sun on a scale of 36 inches to the Sun's diameter. The plates actually used were not more than 18 inches square, so that only a portion of the solar disk could be depicted at each operation. At the November Meeting these photographs were described, and several were distributed to the Members present; and it was stated that, by taking two views of the same sun-spot at an interval of several hours, they could be advantageously studied with the stereoscope, which rendered evident the relative positions of the several parts in regard of altitude and in other respects. In this way Mr. De La Rue had obtained a proof that the faculæ occupy the highest regions of the Sun's photosphere; the spots appearing as holes in the penumbra which inclined in some cases downwards, funnel-like, from the brighter parts of the Sun's disk; portions of faculæ could also be made out to be sailing high above over the spots and penumbræ.

Mr. De La Rue states that he has been much occupied during the past year in measuring the photographs procured of the eclipse at Rivabellosa in 1860, by means of a new measuring instrument, and that the results obtained show that photography is capable of yielding the most accurate numerical data, as well as of depicting the physical features of astronomical objects.

The tube of the Kew heliograph is now mounted on an outrigger affixed to the declination axis of his large Equatoreal, and is for the present under the charge of his photographic assistant, Mr. Reynolds.

Several drawings of Comet II. 1861, have been made, but all attempts at photographing it completely failed; not only was no impression procured with the reflector, but even with a short focus portrait-lens and an exposure of the sensitive-plate during 15 minutes, not the slightest trace of the comet could be obtained; the stars in its neighbourhood imprinting themselves perfectly.

Professor William Selwyn, of the College, Ely, has, by means of a small instrument constructed by Dallmeyer, on the plan of the Kew heliograph, procured some very good solar photographs. Unfortunately, the instrument has no position-wire, so that there was no means of determining the co-ordinates of the spots.

M. Faye communicated to the Académie des Sciences in December last, that he had succeeded in obtaining, photographically, a complete series of transit observations of the Sun, and of registering the exact moment of the production of each image by means of electro-magnetism. An assistant, in exposing the plate, at the same time brought into action the electro-magnet, but M. Faye points out that the assistant may be replaced by an automatic apparatus connected with the transit clock. In this way a plan, suggested as possible in 1849, and in part carried out by M. Liais, a French astronomer, who formed one of the Brazilian expedition to observe the total eclipse of 1858, has been finally brought to a successful issue by M. Faye.

M. Vernier of Belfont obtained six photographs of the eclipse of December 31st last; these photographs were each procured in a small fraction of a second, notwithstanding which, and also the sky being perfectly clear at the time, in four of the photographs the Sun's image is surrounded by a halo, which M. Vernier appears to consider as in some way appertaining to the Sun. No such halo surrounds the Sun's image in the Kew photographs, the negative impression of the Sun standing out on a perfectly transparent background. Most probably, therefore, the halo is due to irradiation or to over-exposure, when our atmosphere in apparent contiguity with the Sun will imprint itself.

Mr. Dallmeyer is under Mr. De La Rue's direction constructing a Heliograph, ordered by M. Otto Struve for the Russian Government: it is destined to be placed in the Observatory of Wilna. Messrs. Simms are also making one of Mr. De La Rue's measuring instruments, to be used in connexion with this heliograph.

From the attention which astronomical photography is attracting, it is likely that it will soon be adopted as one of the means of recording phenomena in some of the government Observatories, and that more especially sun-observations will

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be made by it, from the circumstance that sun-pictures are obtainable with great facility and instantaneously.

Professor Kaiser, Director of the Observatory, Leyden, has intimated that a new Observatory on a grand scale has been recently completed at Leyden, and supplied with excellent instruments; although not yet in full activity, some experiments have been already made by Mr. P. T. Kaiser, son of the Director, having for their object the application of photography to astronomy. The instrument employed was the new 7-inch Munich refractor by Merz, and some lunar photographs have been taken with it, which, however, in consequence of the driving clock of the instrument not having sufficient power, are not so perfect as could be desired.

The erection of telescopes in more favourable situations than British islands afford, has received increased attention of late years, as evinced by the expeditions of Prof. Smyth to Teneriffe, and of Mr. Lassell to Malta. A proposal made about ten years ago, to erect a reflector of the largest dimensions in Australia, proved abortive from the difficulty of finding the corresponding Observer. A little later, however, another scheme was the subject of much correspondence between certain Fellows of this Society, which was principally suggested by the destruction of the Observatory at Lucknow, and the confirmed unhealthiness of Madras, and the presence at the head of the India Board of a nobleman with whom the motives of astronomical enterprise would find appreciation, and such aid as his department could afford. The social and financial disturbances caused by the Indian Mutiny, however, prevented progress at that time with any prospect of success. But, during the past year, the subject was brought definitely before the Council of the Society in the form of an offer by Capt. Jacob to provide an Equatoreal of high excellence, to transport it to a hill station near Poonah, and work it in that admirable climate at an elevation of nearly 5000 feet above the sea for three years, provided certain of the heavier incidental expenses were provided for by the exertion of the influence of the Council. The offer was accepted after consideration by a Committee, and application for a grant of public money was made to the First Lord of the Treasury, and by whom the sum required was submitted to Parliament and voted very shortly after, as the letter recently printed in the *Monthly Notices* has already shown. The required assistance being thus readily promised, it remains to state that the Council expect as the result, not a mere record of tests showing the degree of excellence of the climatic conditions obtained, but some considerable additions to the details of the physical scrutiny of celestial objects, which may induce other observers of independent position to regard a good climate of equal importance with a good telescope, and to go wherever it may be necessary to find it. The success of the enterprise will depend very much on the health of Capt. Jacob, who is expected to set out very shortly, and who will carry with him the good wishes of all who know him.

There was laid on our table within the year, as a present from the author, a short treatise "On the Motions of Fluids and Solids relative to the Earth's Surface," by W. Ferrel, Assistant upon the American Ephemeris. The work is intended to show that a complete mathematical investigation, setting out with the general equations of motion, leads to the same conclusions which were arrived at by the author previously, in a tract in which mathematical formulæ were avoided, and of which the subject was the modifying influence of the Earth's Rotation on the General Movements of the Atmosphere. The work belongs rather to meteorology and general physics; but it is possible that, by a slight extension of his investigation, the author might bring it within the department of physical astronomy, and contribute to our theoretical knowledge of the phenomena of the Sun's surface. The expression of our wish that he may resume the treatment of his problem under this other aspect, may induce him to earn our thanks by looking into another collection of observed facts, which much requires theoretical aid.

An immense addition has lately been made to our store of registered positions of stars, by the publication of the two first sections of Dr. Argelander's Bonn Catalogue, the first containing about 111,000 reduced positions, and the second about 105,000. A third section, which is already fully written out and in the printer's hands, will complete this great work. The corresponding charts, which Dr. Argelander has well regarded as necessary accompaniments of a Catalogue, are published to about the same stage of progress. Of the beauty of arrangement and execution of both Catalogue and Charts it is difficult to speak with moderation: to our view they are the perfection of astronomical workmanship in the branch they belong to. As very often happens, the execution of one work creates the necessity of another; and what has been for some time clear to a few will shortly be, if it is not now, plain to all, that what Argelander has done for the Northern hemisphere of stars must forthwith be done for the Southern. The plan is perfectly defined by his example, the limits of time and money equally so, and little else remains than to see whether an unofficial astronomer will seize the opportunity of distinction, or whether the Council of this Society, or some official Astronomer of this or a foreign country, shall take up the second half, and associate himself

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with the veteran astronomer of Bonn in the crowning work of his life. Fellows of the Society will recollect that a report of this work was given by Argelander's desire in our number for December last.

The group of minor planets has received an accession of nine new members since the last Annual Meeting of the Society. The first, *Ausonia*, was discovered at Naples on the 11th of February by Professor De Gasparis; the second, *Angelina*, at Marseilles on the 6th of March, by M. Tempel; the third, *Maximiliana*, at Marseilles on the 10th of March, by M. Tempel; the fourth, *Maia*, at the Observatory of Harvard College, U.S., on the 10th of April, by Mr. Tuttle; the fifth, *Asia*, at Madras on the 18th of April, by Mr. Pogson; the sixth, *Leto*, at Bilk on the 29th of April, by Dr. Luther; the seventh, *Hesperia*, at Milan on the 29th of April, by M. Schiaparelli; the eighth, *Panopea*, at Fontenay-aux-Roses on the 5th of May, by M. Goldschmidt; the ninth, *Niobe*, at Bilk on the 13th of August, by Dr. Luther. The aggregate number of bodies in the group now amounts to 71.

Three new comets have been discovered during the past year. The first was discovered at New York by Mr. Thatcher. A parabolic orbit has been found to satisfy the observations. The second comet of the year must be regarded as one of the most splendid of modern times. It was first seen generally throughout Europe on the evening of the 30th of June, but it was subsequently found to have been seen as early as the 13th of May by Mr. Tebbutt, an amateur astronomer residing in New South Wales. During the first few nights after it became visible in Europe, the head shone with extraordinary splendour; the tail, also, exceeded 100° in length. In consequence of the unfavourable season of the year at which it appeared, it soon ceased to form a conspicuous object in the heavens; but it continued for a long time to be visible in telescopes even of moderate power. Several computers have formed elliptical elements for its orbit; but until the totality of the observations shall have been subjected to a complete discussion, no trustworthy results can be arrived at. The third new comet, announced since the last Annual Meeting of the Society, was discovered on the 29th of December at the Observatory of Harvard College, U.S., by Mr. Tuttle. It is still faintly visible as a telescopic object. A parabolic orbit appears to satisfy the observations.